

SOME OBSERVATIONS ON *GIGARTINA*
PISTILLATA (GMEL.) STACKH. FROM
PORT ALFRED WITH A RECORD OF
PLANTS BEARING BOTH TETRASPORES
AND CARPOSPORES.

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(With Plate VII.)

Most Florideae show an alternation of diploid and haploid individuals, the former bearing tetraspores and the latter bearing the male and female reproductive organs, usually on distinct individuals. Species with an alternation of tetrasporic and sexual individuals sometimes show deviations from the normal pattern in that tetrasporangia and sexual organs occur on the same individual. Such abnormalities have been recorded for about seventy species (Drew, 1951). They are prominent among the Ceramiales and especially among the Ceramiaceae (Fritsch, 1945; Drew, 1951).

The general morphology of tetrasporic and sexual individuals is the same in most of those species of Florideae where an alternation of tetrasporic and sexual individuals is found. There are, however, some exceptions. The best known South African example is afforded by *Gigartina stiriata* (Turn.) Aresch, the tetrasporic plant of which has such a distinctive appearance that it was at one time thought to be a distinct species, *G. burmanii* (Mert.) J. Ag. A further example is presented by *G. pistillata*. The tetrasporic plant of *G. pistillata* shows profuse dichotomous branching in one plane, the axes being more or less terete. The tetrasporangia are sunk in the tissues of the thallus and occur in somewhat distorted small marginal areas along the sides of the more distal branches. The tetrasporangial areas are irregularly scattered and to a greater or lesser extent they may run into one another (Fig. 1). Only limited material of the male plant has been obtained but it seems to have much the same appearance as the tetrasporophyte. The carposporic plant differs from the tetrasporophyte in having numerous simple or branched ramuli arising at right angles to the dichotomous branches which bear them (Fig. 2). A greater or lesser number of these ramuli bear one or more sessile cystocarps although cystocarps borne in a terminal position may appear to

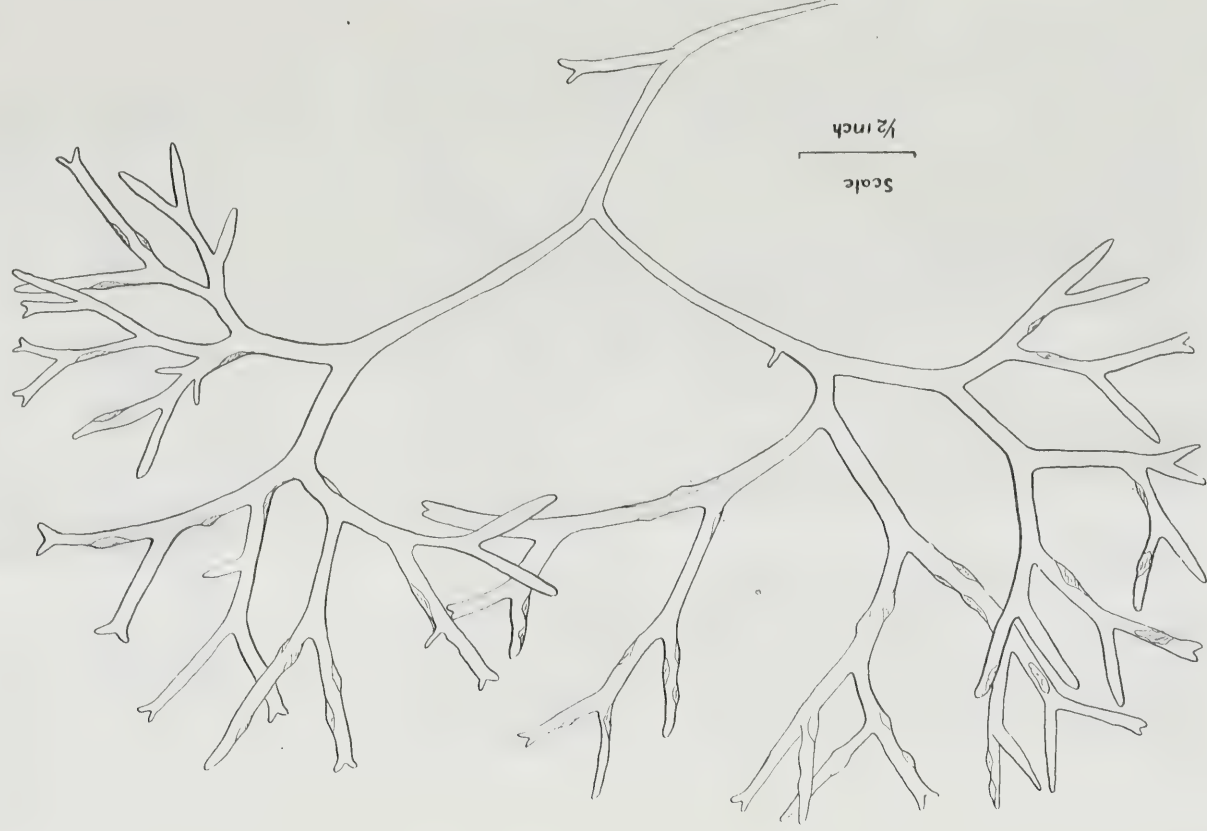


FIG. 1. Tetrasporic plant of *Gigartina pistillata* (Gmel.) Stachb.

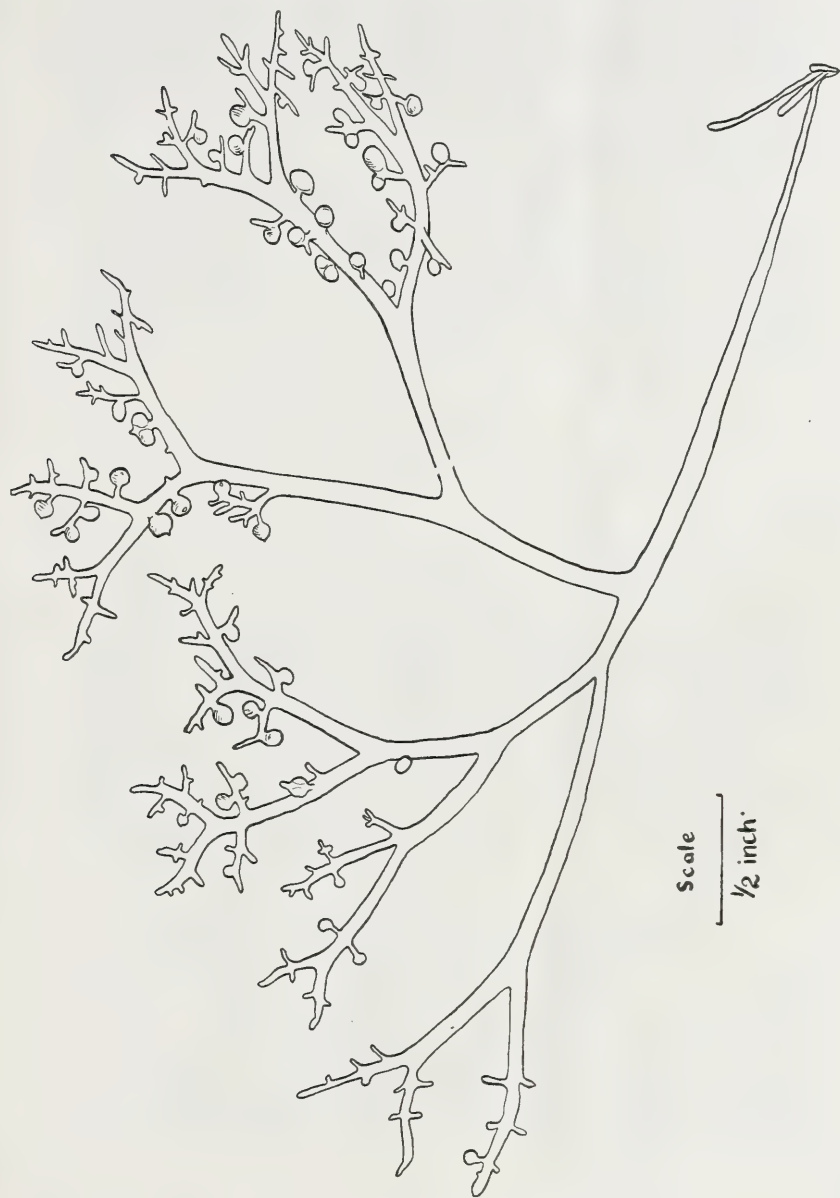


FIG. 2. Carposporic plant of *Gigartina pistillata* (Gmel.) Stackh.

be stalked. The presence of numerous ramuli gives the carposporic plant a distinct appearance since only occasional ramuli are found on tetrasporophytes. The ripe cystocarps open to the outside by means of an apical pore (Fig. 3). The descriptions of Gmelin (1768), Dawson Turner (1808) and de Toni (1897) do not make it clear that the species

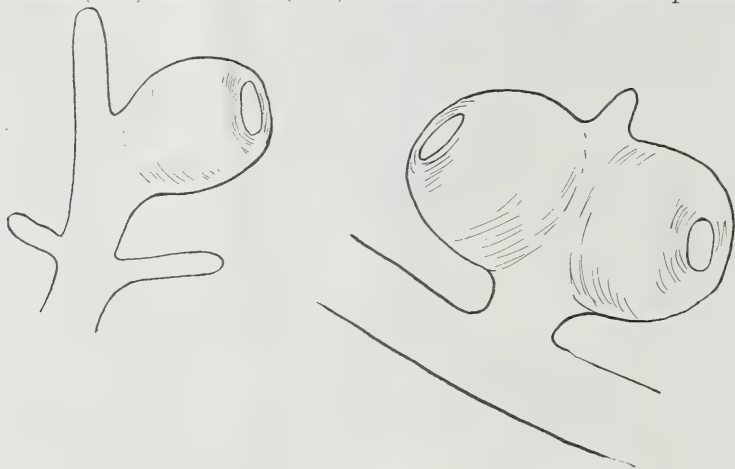


FIG. 3. Ramuli of *Gigartina pistillata* (Gmel.) Stackh. bearing cystocarps.

comprises two morphologically distinct plants, the type lacking numerous ramuli being possibly regarded as immature. Kützing and Harvey on the other hand, clearly recognize two forms within the species. A carposporic and tetrasporic plant are figured by Kützing in Plate I, Vol. 18, of his *Tabulae phycologicae* (1868) and the microscopic anatomy of these forms is figured in his *Phycologia Generalis*, Plate 70 (Kützing 1843). Harvey's comment is quoted below. "Barren specimens and those which produce tetraspores, have the forked branches usually naked; in tubercle-bearing individuals, on the contrary, they are pinnated with short, horizontal, simple or forked ramuli, two to three lines long". (Harvey, 1846-51).*

In Stephenson's list of algae collected during his investigations on the intertidal ecology of South African shores (1947) *Gigartina pistillata* is listed with a question mark. The validity of the name for the South African plant was raised in correspondence with Professor G. F. Papenfuss

*Gmelin refers to the plant under *Fucus pistillatus* and figures (Plate 18) a portion of a carposporic plant only. Dawson Turner describes the plant under *Fucus gigartinas* and figures (Plate 28) the carposporic plant but includes smaller fronds without ramuli in his drawing. The other authorities quoted refer to the species under *Gigartina pistillata*.

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who wrote: "Although, geographically, this species is rather far removed from the type locality, it clearly resembles the European plant and for the present I am regarding it as belonging to the same species". The material handled by us (Isaac 126, 127, 128) certainly corresponds to the description of the species given by the authorities already quoted. The species was also listed by Barton who erroneously gives the authority as J. Ag. (1893) and by Delf and Michell (1921).

In May 1951 *Gigartina pistillata* was collected by the senior author at Port Alfred (near Port Elizabeth). It is not a prominent species on the Port Alfred Coast but in one small area well protected from the force of the waves where the beach is uneven with small scattered boulders, *G. pistillata* was found to be a prominent species at low inter-tidal levels. In

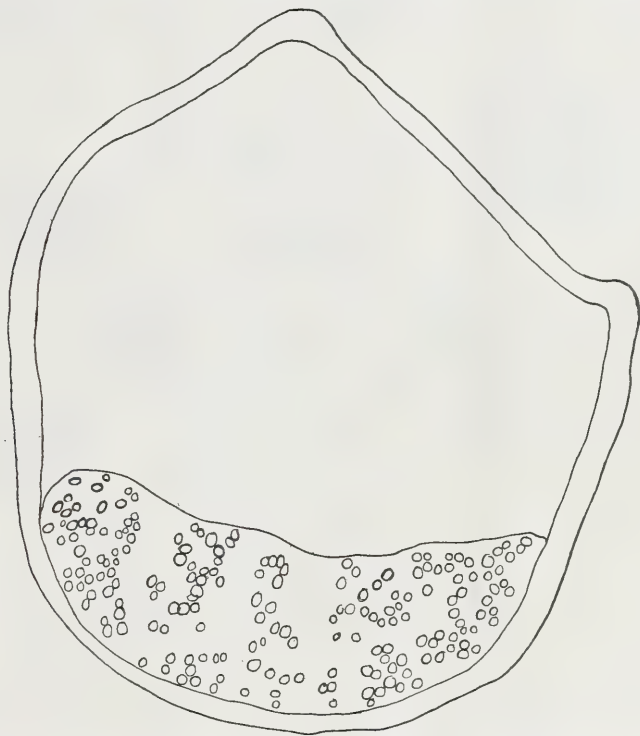


FIG. 4. Diagram of T.S. of branch of tetrasporic plant of *Gigartina pistillata* (Gmel.) Stackh. showing tetrasporangial region sunk in the thallus tissue.

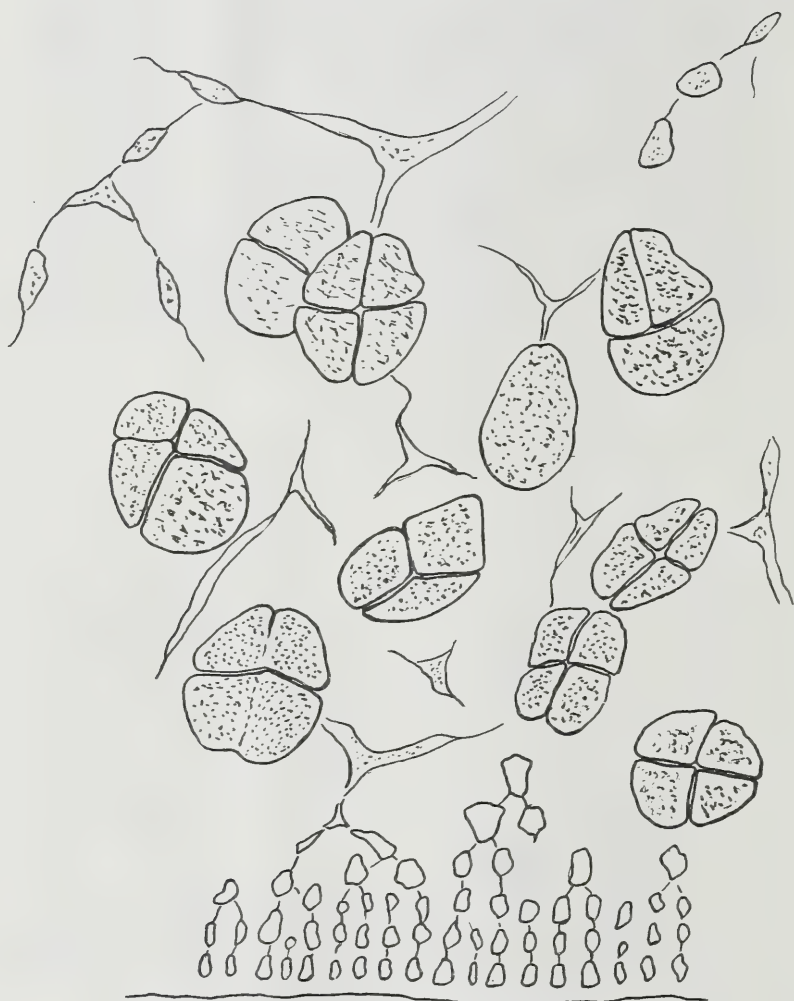


FIG. 5. Part of section shown in Fig. 4 more highly magnified. Note tetraspores cruciately arranged.

this region the seaweed vegetation at low intertidal levels is mostly dominated by *Hypnea spicifera* (Suhr.) Harv. although in situations less exposed to wave action *Caulerpa racemosa* (Forssk.) J. Ag., var. *zeyheri* (Kütz.) W. v. B. is the dominant species. In the very sheltered spot referred to above the algal vegetation was observed to be very mixed but with *Hypnea spicifera* relatively rare. On the whole, *G. pistillata* was dominant there being an admixture, it would seem, mostly of carposporic and tetrasporic plants but a few male and some sterile plants were identified. The plants of *G. pistillata* were observed to be a very dark bottle green colour although they dried on herbarium sheets to a dark brownish-purple. In the various descriptions seen of this species the colour is described as some kind of red or purple—dark bluish-red, dark red, a deep purple or somewhat purple. Dawson Turner, however, refers on the authority of Lamouroux to a smaller form (var. β) which



FIG. 6. Diagram of L.S. of cystocarp of *Gigartina pistillata* (Gmel.) Stackh.

varies in colour from green to reddish-purple. It may be that *G. pistillata* varies in colour in different parts of its geographical range and even in the same locality under different habitat conditions as is certainly the case with *Hypnea spicifera* (Isaac and Hewitt, 1953).

When sorting out the material collected at Port Alfred in May 1951, a few plants were noted with some branches bearing ramuli with cystocaps, these branches forming a very limited part of the whole plant (Plate VII). On more careful examination it became clear that these plants were fruiting, non-carposporic plants bearing a few cystocarpic branches. Sections showed that the plants were tetrasporophytes (Fig. 4) and many of the tetrasporangia were seen to contain four tetraspores cruciately arranged (Fig. 5). Sections showed also that the cystocarps contained carpospores (Figs. 6 and 7).

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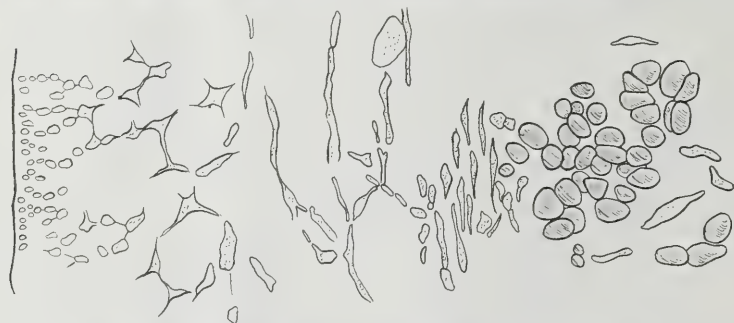


FIG. 7. Part of section shown in Fig. 6 more highly magnified.

REFERENCES.

- BARTON, E. S., 1893: "A provisional list of the marine algae of the Cape of Good Hope", *Jour. Bot.*, vol. 31, p. 138.
 DELF, E. M. and MICHELL, M. R., 1921: "The Tyson collection of Marine Algae", *Ann. Bolus Herb.*, vol. 3, p. 89.
 DE TONI, G. B., 1897: *Sylloge Algarum*, vol. 4 (1) Patavii.
 DREW, K. M., 1951: "Rhodophyta", Chap. 9 of *Manual of Phycology* (Ed. G. M. Smith). Chronica Botanica, Waltham Mass., U.S.A.
 FRITSCH, F. E., 1945: *The Structure and Reproduction of the Algae*, vol. 2, C.U.P.
 GMELIN, S. G., 1768: *Historia Fucorum*. Petropol.
 HARVEY, W. H., 1846-1851: *Phycologia Britannica*, vol. 3, London.
 ISAAC, WM. EDWYN and HEWITT, FLORENCE, 1953: "The Morphology, Geographical Distribution and Ecology of *Hypnea spicifera* (Suhr.) Harv.", *Jour. S. Afr. Bot.*, vol. 19, p. 73.
 KÜTZING, F. T., 1843: *Phycologia generalis*. Leipzig.
 KÜTZING, F. T., 1868: *Tabulae Phycologicae*, vol. 18. Nordhausen.
 STEPHENSON, T. A., 1947: "The constitution of the Intertidal Fauna and Flora of South Africa. Part III", *Ann. Natal Mus.*, vol. XI, p. 207.
 TURNER, DAWSON, 1808: *Fuci*, vol. 1. London.



PLATE VII. Two tetrasporophytes of *Gigartina pistillata* (Gmel.) Stackh. bearing carposporic branches. (Scale in inches.)